

He accounts for the idea of a long period of rotation having been and still being upheld, on the ground that between 320° and 150° longitude there are several spots which are somewhat alike, six of which lie in a north and south direction, and two in higher latitudes in an east and west direction.

For this reason, if an observer does not steadily watch the planet from morning till evening every day, but simply makes an occasional observation, he can then easily mistake one spot for another, and imagine that he is observing the same one when he is really observing another, and thus conclude that no apparent motion of the spot is noticeable.

Whether this be so or not is, however, the question, but one does not feel quite at liberty to state definitely that therein lies the cause of Schiaparelli's, Tacchini's, &c., deductions of a long period, for certainly they must have convinced themselves thoroughly that such a rapid rotation, which according to Brenner is so apparent, was nevertheless to them very difficult of observation before they committed themselves to definite statements.

The following, but somewhat incomplete, list gives some idea of the views held by observers regarding the time of rotation of the planet under discussion. Column I. gives the names of those who advocate the short period of about 24 hours; column II., with one exception, those who are inclined to the period of, roughly, 225 days, and column III., those who are doubtful. The dates against some of the names refer to the times at which the respective observations were made.

I. Short period.	II. Long period.	III. Doubtful.
D. Cassini (1667)	Bianchini (1727) > 24 ^d	Herschel, Sir W.
J. Cassini (1730?)	Schiaparelli	Beer and Mädler
Schröter (1788-93)	Cerulli	(1833-36)
De Vico (1840?)	Tacchini	
Trouvelot (1877-91)	Mascari	
Leo Brenner		
Stanley Williams		

During the first few months of this year the planet will be a morning star. From the middle of January to the middle of May, her time of rising before the sun diminishes from three hours to half an hour, her apparent diameter decreasing during this time from $16''$ to $10''$. After August she will become an evening star, her apparent distance from the sun increasing. In the middle of November she will set one hour and a half, and towards the end of December three hours, after the sun; her apparent diameter at this latter epoch being $15''$.

W. J. S. L.

THE SEEBOHM COLLECTION.

THE British Museum has always owed much to the generosity of private donors, and this has been exceptionally true in the case of the collection of birds, which is now the finest in the whole world. It is difficult for ornithologists of the present day to imagine what the collection was like five-and-twenty years ago in its old quarters at Bloomsbury. Its principal value then consisted of the type-specimens which it had received from the earlier voyages, and the celebrated Nepalese collection of Mr. Brian Hodgson; but the great series of Australian birds obtained by John Gould had been allowed to go to Philadelphia, apparently without a protest from any public body in England, and to the great regret of Gould himself. He had offered the collection to the nation on reasonable terms, which were afterwards eagerly accepted by Dr. Edward Wilson, who transferred the whole series, with its priceless types, to Philadelphia.

The birds' skins in past years were kept in an underground vault, in wooden boxes, so that if any particular specimen was wanted by a student, the whole lot had

often to be turned out on the table, to render possible a search for the skin required. The time thus wasted was considerable, the damage to the specimens enormous, as they were heaped one upon another in the boxes, and every skin became more or less ruffled and spoilt as time went on. As regards the mounted collection, the absurd idea obtained that the public liked to see all the rare birds, and thus all the valuable types and priceless specimens were stuffed and exhibited, there to wither with the dust and exposure to light, and decay with age. Many specimens of great value, known to have been in the collection of the British Museum at the beginning of the century, are now no longer to be found there; they have doubtless fallen to pieces from decay, and have been thrown away. Even with the utmost care, I find it difficult now to preserve some of the old Montagu collection, the skins never having been properly preserved, and having been mounted with most of the bones inside them. In this way also were preserved the specimens of Captain Cook's voyage, most of which have vanished since the time that Latham described them, and they have doubtless crumbled to pieces.

It is quite certain, therefore, that twenty-five years ago the collection of birds in the British Museum was of small repute, and probably did not exceed 40,000 specimens. Little encouragement was given to travellers to help the national collection, and, excepting in the case of the Antarctic Expedition, and a few of the same kind, the specimens received from explorers on sea and land were few and far between. The best series were in the hands of private collectors. Thus, for the study of Palearctic ornithology, students visited my collection and that of Mr. H. E. Dresser, or that of Mr. Henry Seebohm, already then commencing to loom large. For Ethiopian birds, my own collection and that of Captain Shelley were always available for the purposes of study, and far exceeded that of the British Museum in number of specimens. For Indian birds, that of the late Marquis of Tweeddale was the one generally consulted, and in India the influence of Mr. Hume was at work, and his collection was already assuming large proportions. The collection formed by the late Consul Swinhoe was the best as regarded Chinese birds, and Dr. A. R. Wallace still retained in his hands the chief set of the specimens obtained by him during his travels in the Malay Archipelago, with all the types. The best collection of Australian birds was that in the possession of Messrs. Salvin and Godman, though Mr. Gould had a large number of valuable specimens, gathered together during the previous thirty years, since the sale of his original collection. As regards American birds, the absolute dearth of species in the national collection can be estimated from a glance at the late George Robert Gray's "Hand-list of Birds," published in 1869-71, then the authentic record of what the Museum possessed, where genus after genus is scantily represented, and the series of species is lamentably defective. With regard to those of the Neotropical region, no great Museum, in the year 1872, probably stood at a greater disadvantage than the British Museum. The majority of the types of American Passeres were in the collection of Dr. P. L. Slater, and, for a general series, nothing in Europe could surpass that of the Salvin-Godman cabinet.

In 1896 it is interesting to note the present location of the above-mentioned private collections. They are *all* in the British Museum. With the acquisition of the Wallace collection in 1874, commenced that era of improvement in the ornithological collection which has steadily progressed, and is still progressing at the present day. The Gould, Slater, Shelley, and Sharpe collections, with many others of greater or less importance, have passed into the hands of the Trustees. Then came, in 1885 the magnificent donation of Mr. Allan Hume, followed by that of the Tweeddale collection

presented by Major Wardlaw Ramsay, to whom it had been bequeathed by his uncle, the Marquis of Tweeddale. Messrs. Salvin and Godman not only gave their unrivalled set of American birds, but Mr. Godman supplemented this splendid present by employing a staff of collectors to work out the ornithology of Mexico, and presented the results of their expeditions to the Museum. He also purchased the celebrated Henshaw collection, and gave it to the nation. Many other collections have since been acquired by him, and likewise presented to the Trustees of the British Museum. Only lately can it be said that we possessed in England a representative set of North American birds.

Meanwhile, although the series of Indian, African, Australian, and American birds had become adequate and representative, the ornithology of the Palæarctic region was but feebly illustrated. Through the exertions of Lord Walsingham and other English ornithologists, the nesting-habits of our British birds have been successfully demonstrated by the well-known series of groups in the Natural History Museum; but the birds of Europe and Northern Asia were poorly represented in its cabinets. By the splendid bequest of Mr. Henry Seebohm, this vacuum in our Palæarctic collections has been filled, though there is no one in the Museum who does not feel that this addition to the strength of its ornithological section has been attained only through the loss of one of the truest friends of the institution which his dying wishes have enriched. There has not yet been time to register and incorporate the specimens of the Seebohm collection, but we know that we have now received the principal collection of Palæarctic birds of modern times.

A few years ago Mr. Seebohm presented his collection of eggs, and, with this as a basis for the work, the entire series of oological specimens in the Museum was set in order and arranged under his own supervision by my daughter, Emily Mary Sharpe, till it was found that, with the Hume and Salvin-Godman collections, the British Museum could boast of a series of 48,000 eggs of birds.

In the same generous spirit, he freely gave the type-specimens of any birds he possessed, that the value of the "Catalogue of Birds" might be enhanced thereby; and now, by leaving the contents of his Museum to the nation, the British Museum becomes possessed of several invaluable additions to its ornithological collection. Thus are added: the Swinhoe collection of Chinese birds, the Pryer collection of Japanese birds, the series of specimens obtained by Holst in the Bonin and Loo-choo Islands, and Formosa; and last, but not least, his own European and Siberian collections, the result of his travels in all parts of Europe, and of his expeditions to the valleys of the Petchora and the Yenesei. Of his collection of *Charadriida*, he had already presented hundreds of specimens to the Museum, but by his bequest is added the series which formed his special series of the plovers and snipes, on which, indeed, was founded his great work on the geographical distribution of the *Charadriida*. He had, moreover, in contemplation a "Monograph of the Turdida, or Family of Thrushes," and in pursuance of this object he had amassed a large collection of thrushes, which now passes into the ornithological collection of the British Museum. Nests and skeletons of birds are in plenty, and a set of the Layard collection of Oceanic birds and others from the Whitehead expedition to Kina Balu, the Prjevalski and Severtzov expeditions in Central Asia, make up one of the most important donations which the Trustees of the British Museum have ever received. His series of skins of the *Phasianida* was one of the finest in the world, and the value of the osteological collection cannot be overestimated, as it formed the material on which was founded his many essays on the "Classification of Birds."

In this necessarily imperfect sketch of the contents of

the Seebohm collection, of which a fuller account will only be possible when it has been arranged and registered in the archives of the British Museum, it is impossible to give a detailed history of the various collections which constitute its importance to ornithologists. I feel, however, that I cannot close this article without expressing my opinion of the great loss which ornithology in general, and this country in particular, have sustained by the death of Mr. Seebohm, for, had I space to tell, it would interest naturalists to know how the great collection of birds in the Natural History Museum has been built up, by the help of such men as Henry Seebohm and the other munificent, though unostentatious, donors whose names I have recorded above. I believe, however, that under the enlightened sway of its present Director, the Museum has a still greater future before it than it has enjoyed in the past, and that when the common people have the opportunity to "read, mark, learn, and inwardly digest" the lesson which the Museum is trying to teach, the nation at large will still more fully appreciate the work of such men as Henry Seebohm.

R. BOWDLER SHARPE.

MOVEMENT.¹

SOME of the results of the researches of M. Marey on the movements of men, horses, and fishes, have appeared from time to time in English papers. The skill and originality displayed by M. Marey in experimental work, involving great difficulties, must have astonished many, at a time when the idea of taking a rapid succession of photographs of a moving object was new.

The method of determining time-periods by means of a continuous chain of photographs appears to be due to Mr. Jansen, who used it in 1874 to record the transit of Venus across the sun's disc; he also suggested that the method might be applied to the study of animal locomotion. The subject of intermittent photography was attacked by Mr. Muybridge, who discovered, by means of a method different from that suggested by Jansen, the analysis of the locomotion of men, horses, and other animals. Mr. Muybridge took successive photographs of moving animals, using a battery of cameras and lenses, each plate being exposed automatically at the required instant; he also produced photographs of pigeons in flight. The end aimed at by Marey was to use a succession of photographs for chronographic purposes: photographs so taken have been called chronophotographs; his method of procedure is as follows. The object to be chronophotographed performs its movements in full sunlight before a black background of unilluminated velvet. The camera employed is furnished with a slotted disc (*disque fenêtre*) which can be uniformly rotated; as each slot cuts the beam of light reflected from the moving object, the sensitive plate receives an impression, which gives the exact form and position of the object at the instant, the duration of exposure being $\frac{1}{500}$ th of a second, and the interval between the formation of each image $\frac{1}{100}$ th of a second. A chronometric dial is so placed that the position of its revolving pointer is recorded on the same sensitive plate; this instrument serves to indicate both the time of exposure and the time between successive exposures, the pointer of the chronometric dial being driven at a known uniform velocity.

Provided with this instrument, and the photographic gun (which is described on pp. 108-115), and certain other special arrangements for the chronophotography of fishes, the excellent results shown in "Movement" have been obtained.

Mr. Eric Pritchard, assisted by his sister Mrs. Chalmers

¹ "Movement." By E. J. Marey. Translated by Eric Pritchard, M.A., M.B., B.Ch. (Oxon.) 323 pp., 200 illustrations. (London: William Heinemann, 1895.)